DATA PROCESSING DIGEST

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General Information

THE AUTOMATIC CREATION OF LITERATURE ABSTRACTS

H. P. Luhn, IBM Corporation
IBM JOURNAL OF RESEARCH AND DEVELOPMENT, April 1958; pages 159-165.

"The abstracter's product is almost always influenced by his background, attitude, and disposition." This fact may bias the interpretation of the author's ideas so that the quality of abstracts would vary among abstracters. Research into machine literature searching methods now indicates that "both human effort and bias may be eliminated from the abstracting process." Some research in this area is described in this article. "...The new mechanical method selects those among all the sentences of an article that are the most representative of pertinent information." Selection is made by means of a significance factor derived from an analysis of the words in each sentence. It is proposed that "the frequency of word occurrence in an article furnishes a useful measurement of word significance. It is further proposed that the relative position within a sentence of words having given values of significance furnishes a useful measurement for determining the significance of sentences. The significance factor of a sentence will therefore be based on a combination of these two measurements."

It follows that, "whenever the greatest number of frequently occurring different words are found in greatest physical proximity to each other, the probability is very high that the information being conveyed is most representative of the article."

The results of experiments based on this formula (derivation of which is described in the article), performed on about 50 articles of from 300 to 4500 words each, "have been encouraging enough for further evaluation by a psychological experiment involving 100 people. This experiment will determine on an objective basis the effectiveness of the abstracts generated."

Two abstracts are included in the article--one, four sentences long from a 2326-word article from The Scientific American, the other

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Computer program finds most frequent words for significance factor selection

containing the highest ranking sentence of a 783-word article from the Science Section of The New York Times. A complete reproduction of the latter article is shown. These abstracts were derived in the following manner:

The documents were punched into cards, then recorded onto magnetic tape. The tape was then processed by the IBM 704, which was programed "to read the tape text and separate it into its individual words, to note the position of each word in the document, the sentence and paragraph in which it appeared, and to note the punctuation preceding and following it. Concurrently, common words...were deleted from the list by a table-lookup routine."

Next, the words were sorted into alphabetic order. Then those words which had identical spelling at their beginnings were consolidated, by comparing them letter-by-letter. "From the point where letters failed to coincide, a combined count was taken of the non-similar subsequent letters of both words. When this count was six or below, the words were assumed to be similar notions; above six, different notions.... The machine then counted the occurrence of similar words derived in this way. Words of a stipulated low frequency were then deleted from the list and locations of the remaining words were sorted into order. These words thereby attained the status of 'significant' words."

"A condensation of a document to a given fraction of the original could be readily accomplished with the system outlined by adjusting the cutoff value of sentence significance. On the other hand, a fixed number of sentences might be required irrespective of document length. Here it would be a simple matter to print out exactly that number of the highest ranking sentences which fulfilled the requirement."

NAVY'S "EDP" PRINCIPLES AND OBJECTIVES

NAVY MANAGEMENT REVIEW, March 1958; pages 7, 8.

The Navy has adopted eleven principles for use in planning and operating its data processing installations. They are: integration, operations research, management by exception, systems planning, earliest feasible applications, concurrent reorganization, best use, full use, growth capacity, economic advantage, military advantage. Each of the principles is to be discussed in forthcoming issues of the REVIEW. Integration is discussed in this one. It views integration as a continuous effort to provide immediate access to necessary information through use of EDP. This "demands that any required communications facilities be concurrently developed as an integral part of the EDP system."

In the following issue, April 1958, page 18, the role of management science is discussed. It is stated that while a majority

of the operations research problems needs electronic data processing for adequate solution, even more do EDP systems need to employ operations research to realize the full potential of the system for scientific management.

AUTOMATION'S TEST: DOES IT PAY?

Forde Steele, Central National Bank of Cleveland
BANKING, May 1958; pages 42, 43, 134-138.

Two types of banks are advised to consider carefully before installing the new semi-automatic machines. "The first of these is the bank which has only one or two bookkeepers at the present time and therefore would need only one Sensitronic or Post-tronic. Since these machines are considerably more complex than conventional bookkeeping machines, one can naturally expect that there will be more down-time than has been true with conventional bookkeeping machines. This is not to condemn these excellent bookkeeping machines, but rather to recognize what every user of electronic equipment already knows--that electronic equipment does require a greater amount of preventive maintenance and, at least in the present stages of development, does break down occasionally. Therefore, for small banks which would need only one semi-automatic machine, it would seem prudent to make certain that service facilities were near at hand before committing the bank's bookkeeping to a single unit." The other group includes those which expect to have fully automated systems. They are advised "to wait another six months to a year to find out just when fully automated systems may become practicable."

Small banks would need handy substitute machines during down-times

Meanwhile, it is suggested that true single posting can be obtained through the use of the numeric proof system using conventional bookkeeping machines. This method provides "verification of the old balance pick-up and of account selection. Since these two features are the principal contributions of the semi-automatic machines, the numeric proof posting system deserves investigation by [the] two classes of banks."

Account-numbering may be premature

Banks are warned, also, not to leap into an account-numbering system without considering their future needs. Studies have shown that "the average bank with 2500 or fewer accounts has nothing to gain by adopting a full-fledged numbering system and can still gain the benefits of semi-automatic bookkeeping machines or the numeric proof single-posting system by adopting the three-digit random numbering system. Under this plan, accounts are carried in alphabetic order. Every account is assigned a 3-digit number at random. As new accounts are opened, any three digits are assigned and the chances are that no two adjacent accounts will have the same 3-digit number." ((The use of the three-digit numbering system is not fully explained.))

The fully automatic systems "will work best with some variation of the straight numeric system so designed that the high volume accounts can be segregated in the first one or two passes through a sorter. However, while most of the electronic equipment now being designed will work with almost any numbering system, there may be considerable advantage in knowing the specific requirements of the equipment you intend to buy before deciding on a system."

PROCESSING PICTORIAL INFORMATION ON DIGITAL COMPUTERS

TECHNICAL NEWS BULLETIN, April 1958.

Photographs are converted to binary information

The National Bureau of Standards is experimenting with a method of processing information derived from pictures, graphs and drawings by means of programs written for the SEAC. "The photograph to be scanned is mounted on a drum approximately two-thirds inch in diameter. As the drum rotates, a photo-multiplier and a source of illumination mounted on a lead screw move parallel to the axis of the drum.... Through the electronic circuitry of the scanner, a dark square on the picture is converted into a binary one. A sufficiently white square produces a binary zero. The entire picture is scanned in 25 sec. or less."

Output may be either numerical coordinates or a visual display on an oscilloscope. Programs were written and tested to develop a library of computational processes for simplifying patterns in order to obtain their most significant features. Thus, when the programer has decided on a course of pattern analysis, he may select those routines which in combination will best serve his purpose.

One of the simplest routines counts the total black area in a pattern by tallying for each bit that represents a black area. "Advantage is taken of the fact that in many patterns there will be numerous words that are all black or all white. By comparing the whole words against constants of all zeros or all ones, much time is saved."

In another routine, all the objects in a picture are counted. A variation of this routine evaluates the area of an object (that is, the total black part of the object). From these, routines were developed to determine the number of objects having a greater area than a certain value. A trivial modification of the routine would allow counting and classifying the objects according to their area.

Character-recognition logic may be simulated

An important use for the experimental picture processing is in the simulation of character-recognition logic, for example, studies on identification of unique areas for each character in an alphabet. "Studies can now be made of characters in different fonts to determine the percentage of useful recognition areas that characterize the different fonts."

Additional experiments have been made on the effect of "noise" in pictures. Future possibilities may be the automatic coding of

chemical and electrical diagrams, simulation of logical procedures for recognition of printed characters, and photogrammetric analysis of stereographic photographs for automatic production of contour maps from photographic information.

HOW TO MAKE A COMPUTER WORK—AND PAY OFF

FACTORY MANAGEMENT AND MAINTENANCE, April 1958; pages 94-99.

The Carborundum Company began to study the use of electronic data processing equipment in 1953, and has just completed six months of operation based on an integrated systems approach. The first portion of their long-range plan is inventory record keeping. Future plans call for inventory control, automatic stock replenishment, sales analysis, and mechanization of major administrative procedures.

HIGH-SPEED DATA PROCESSING

C. C. Gotlieb and J. N. P. Hume
Published by McGraw-Hill Book Company, 1958. $9.50.

Book-length descriptions of electronic data processing systems from the equipment and programing point of view are numerous, and usually perform their job fairly well. This one follows in the tradition. It is a good introductory text for persons just beginning to inquire about EDP. The authors are affiliated with the University of Toronto. Several of the applications examples are of Canadian firms, and much of the discussion is from the point of view of persons familiar with the University of Toronto computer, FERUT.

Sorting and file maintenance are discussed

As with other books of this type, programing is well explained through the use of the Hypothetical Machine, unadorned, happily, with an acrostic-type name. Arithmetic notation is also well handled, and some space is given, perhaps in too much detail, to the electronic representation of numbers. An entire chapter is given to the problem of sorting, and to the whole area of file maintenance, a subject frequently passed over rather quickly in similar books. Examples are given of applications in insurance, banking, accounting, inventory control, and planning and scheduling. These use actual applications as examples. The final chapter is devoted to automatic programing. The book has the virtue of being reasonably up-to-date. The appendix contains some problems for the serious student, along with a comparative table of machine characteristics, the code list for the Hypothetical Machine, and a rather unusual bibliography, containing some technical papers and publications not normally found in introductory texts.

DATA PROCESSING MANNING SURVEY

DATAMATION, March-April, 1958; pages 31-33.

A limited survey of companies in the New York area which either have or have ordered EDP systems, was made by the National Research Committee of the Systems and Procedures Association to find data on job requirements and salaries. Twenty-three positions ranging from Data Processing Division Head to Key Punch Operator were included in the survey. Job titles varied widely among the companies, and are shown in the article under the classifications specified in the questionnaires. Systems Analysts are shown here as Senior Programers. Maximum and minimum average salaries are given in a table for each of the 23 positions. Average monthly salary for Division Head was found to be $1150; for Senior Programer, $750; for Computer Programer, $620; and for Senior Console Operator, $595. Nineteen other job classifications and salaries are listed.

PERSPECTIVES IN DESIGN AND DEVELOPMENT

PRODUCT ENGINEERING, April 28, 1958; pages 75, 77.

It is suggested (and urged) that serious consideration be given the problem of character recognition in all fields of endeavor and that printing and reading equipment be designed based on a common type font contained in a 5x7 element grid. The common face, easily converted into a 35-bit code because of its arrangement, would be universally useful in at least six of the presently anticipated automatic reading applications. These are discussed: all important parts of bank checks, paychecks and other media using punch card information for verification, standard forms containing input information, household and store bills sent to customers, large-scale government and industry bookkeeping operations, address-list preparation by large users of mail, teletype and telegraph messages. It is suggested that the users of the type font be given preferential mail handling to encourage its use.

HIGHER MANAGEMENT CONTROL

T. G. Rose and Donald E. Farr
McGraw-Hill Book Company, 1957. $6.50.

One of the questions which a data processing study group must face early in the study is: what should be the outputs of the system? Where general accounting is part of the study, the outputs go to top management and are vital to their control of the business. Two approaches to determining required outputs are possible: (1) to use "classical" management theory; (2) to use OR and statistical control

approaches. The latter is a long-range program (3 to 10 years). Therefore, the EDP group usually chooses to design a system based on a proved, if less scientific, approach, with the understanding that as the OR studies come up with definite proposals, they will be incorporated.

"Classical" approach to data preparation

This book is a very clear, practical statement of the "classical" approach in preparing data for top management. As is common with this approach, it assumes all decisions are based on experience and judgment. Unfortunately, it does not even discuss statistical control techniques. However, good use is made of moving averages, variance reports and the translation of period figures to "sales days" for comparison with balance sheet data. The concept of the calculations of working capital is made very clear.

Definite charts and graphs are proposed, together with examples of their timing and interpretation, which permit a review of all the factors important to top management in performing its month-by-month financial control function. All managers will find this book a good review, and in many cases it will clarify their picture of the financial structure of business.

MEN, MACHINES, AND METHODS IN THE MODERN OFFICE

AMA Management Report No. 6.

Sixteen papers on both the mechanical and the human aspects of data processing are presented in this report. The first section on machines gives some viewpoints of the automated input problem. One of these discusses "output-controlled punched card input," such as punched card checks, bills, order cards, etc. Some variations of the pre-punched card tub file are also mentioned. An interesting description is given in another paper in this section of the IMR optical-scanning equipment used by Readers Digest to read names and addresses typewritten on 90-column punched cards. The Scandex, Stanomatic and SRI Bank of America systems are also mentioned briefly. Direct input devices used by airlines and savings banks, and point-of-sale equipment as used by the Air Materiel Command are discussed in two separate papers. A suggestion for the use of Social Security numbers as a universal account numbering system is suggested in the first section. This paper also reports briefly on research being done by the Post Office Department and the National Bureau of Standards toward simplified addressing.

A case study of "A Functional Office" is the content of the third section of the report. This describes the organizational setup of Standard-Vacuum Oil Company of White Plains. The remaining papers discuss various aspects of the manager's responsibility, including good communications, reporting, and human relations. Price of the report: $3.75 (AMA members: $2.50)

THE AUTOMATIC OFFICE

A monthly management report is being published by Automatic Office Consultants, Inc. This contains short articles and editorials on the general field of EDP. Some of the articles are reprinted or digested from other periodicals. The average issue is 16 pages plus a cover. General appearance and format is similar to Data Processing Digest. Price: $24.00 per year.

TIMS COLLEGES

The Institute of Management Sciences (TIMS) has established "Colleges" for specific areas of interest. At present these Colleges include: Planning, Production Control, Simulation in Management, and Measurements in Management. Activities of the various Colleges will include symposia, research projects, contributed papers for the annual and regional Institute meetings. Members may belong to any number of the Colleges. Others are to be organized as the members request them. Information about participation in present Colleges or formation of additional ones may be obtained from Dr. M. E. Salveson, 16 Parish Road, New Canaan, Connecticut.

Equipment

SPEEDREADER 2000

A new punch card reader called the Speedreader 2000 has been developed by Uptime Corporation, 620 Gould Lane, Hermosa Beach, California. This device reads cards photoelectrically at the rate of 2000 per minute. The system may be adapted to either electronic data processing or electro-mechanical accounting systems.

Management Decision-making Techniques

SIMULATION: VERSATILE AID TO DECISION-MAKING

S. Reed Calhoun and Paul E. Green, Lukens Steel Co., Coatesville, Pa.
ADVANCED MANAGEMENT, April 1958; pages 11-16.

The "Monte Carlo" technique of simulation is described as "an attempt to characterize the real system under study by means of a descriptive model of that system which can be manipulated and with which various alternates can be tested by simulation without touching the real counterpart of the model." The characteristics of the simulation process include many variables interacting on some output of the system, and the stochastic nature of some of the variables (that is, they involve a probability distribution).

Steps in model-building

"The closer, of course, that the model can be made to reflect its physical counterpart the more reliable will be the results derived from the simulation. A typical simulation might involve the following steps: 1. Some measure of effectiveness of the system, e.g., total delay time, output or profit is chosen as the pertinent variable to optimize. 2. A flow-chart of the process under study is laid out and the variables acting upon the measure of effectiveness are isolated. Inasmuch as the final validity of the model depends upon this step... the expert judgment of operating personnel must be brought to bear on the selection of these variables. 3. Data are assembled on the variables of Step 2 and probability distributions are constructed. 4. The environment represented by Step 3 is manipulated through the employment of some randomizing device which 'manufactures' a typical sequence of events which are subjected to the change under study. 5. After a large number of such repetitions are performed the effect of the change on the environment is summarized. 6. The results of the change are related to the measure of effectiveness. 7. Additional systems alternates can be brought in and evaluated (either individually or in combination) by the same procedure."

A case study illustrates the use of these steps in simulating the operation of Open Hearth furnaces. Charts and graphs are included to show the procedures used. The article concludes with some advantages and disadvantages of simulation. The disadvantages: Only approximations may be obtained, and unless computers are available the procedure is tedious and time-consuming. Advantages: The system offers versatility in handling large numbers of problems involving probablistic elements, conceptual ease of formulation, and easy communication of the research results to the potential user.

HEURISTIC PROBLEM SOLVING: THE NEXT ADVANCE IN OPERATIONS RESEARCH

Herbert A. Simon and Allen Newell, Carnegie Institute of Technology
OPERATIONS RESEARCH, January-February, 1958; pages 1-10.

A plea is made for operations research in the areas of judgmental decisions--those areas which cannot be readily reduced to systematic computational routines. So far, "there are no known formal techniques for finding answers to most of the important top-level management problems." In such "ill-structured" problems, "essential variables are not numerical, but symbolic or verbal.... the goal is vague and non-quantitative," and for many practical problems computational algorithms are not available. In fact, "the majority of decisions that executives face every day....lie much closer to the ill-structured than to the well-structured end of the spectrum."

"Ill-structured" problems could be computer-solved

Research is now beginning to dissolve "the mystery of how humans solve ill-structured problems. Moreover, we have begun to learn how to use computers to solve these problems....We now know, at least in a limited area, not only how to program computers to perform such problem-solving activities successfully, we know also how to program computers to learn to do these things."

For example, a program has been written permitting a computer "to learn to distinguish between figures representing the letter O and figures representing A presented to it 'visually.'" Another program has been written giving the computer the ability to discover proofs for mathematical theorems in the "creative" and "intuitive" manner of the scientist. "The program is also being used to predict the behavior of humans when solving such problems."

Other research is being done in such human activities as language translation, chess playing, engineering design, musical composition, and pattern recognition. One computer is designing small standard electric motors from customer specifications to the final design.

However, "computers for heuristic problem solving will replace executives only when the costs per unit of problem-solving capacity are competitive with the costs for executives."

Applications

CHRYSLER STOCK INVENTORY

COMPUTING NEWS, April 15, 1958; pages 17, 18.

Chrysler's Service Parts and Accessories Supply Division uses an IBM 702 to process order card information for inventory control and reorder information. "A glance at the stock status report for any given part type and number tells exactly how much is on hand at any plant, how much is moving, current status, and when reordering is necessary. It also shows the sales by quarters, semi-annual and annual orders, domestic and export."

A NATION-WIDE SYSTEM FOR AUTOMATIC PROCESSING OF BUSINESS DATA

W. F. Gregory and W. J. Walsh, Western Union Telegraph Co., New York
Conference Paper No. 58-592, A.I.E.E.

Western Union has established five integrated data processing centers to process business data for their geographical areas, received from local W. U. offices via telegraph lines. An adding machine incorporating a 5-channel paper tape punch is used at the data origination stations. The system will process data for producing payrolls and checks, information about availability of equipment and parts, and daily work schedules of the field employees.

A copy of the paper may be ordered from the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, New York. Price is 40¢ each for members, 80¢ each for nonmembers.

AN ELECTRONIC TEACHER

THE ACCOUNTANT, April 12, 1958; page 440.

And now we have SAKI, the Solartron Automatic Keyboard Instructor, designed by the Solartron Electronic Group Ltd., in London. This electronic teacher, designed for the training of key-punch operators, adjusts its teaching rate "to the pupil's ability to absorb and execute; the 'teacher' notes weaknesses, strengths and errors, and adapts the pupil's exercises and tests accordingly. Sometimes the preferential actions of certain fingers with particular keys causes a slightly uneven speed of operation, an unevenness that can be small enough to pass unnoticed by the operator and a human tutor. SAKI, however, detects such actions and corrects them by modifying exercises accordingly."

ELECTRONIC ADVANCES—NORTHWESTERN MUTUAL LIFE

THE SPECTATOR, March 1958; page 26.

Northwestern Mutual Life opened its electronic data processing center in February. The company processes each day's transactions on its IBM 705 after the close of the business day. By the following morning, the company has a completely updated master file. ((See DPD: March 1958, page 9. This is the daily cycle method as opposed to the monthly cycle.))

ELECTRONIC ORDER-FILLING IN GERMANY'S BIGGEST MAIL BUSINESS

STORES, April 1958; page 41.

Quelle of Fuerth, Germany's largest mail order house has installed an electronic ordering system which can process 50,000 orders daily. The system provides immediate access to inventory information on Quelle's 15,000 lines of goods from 50 order desks. The system figures prices, adds and tabulates each order, computes shipping and postage costs, deletes unavailable items from the order, updates stock status, and does many other chores in the order and stock control procedure. The electronic system is the newest addition to the company's automated stock handling system.

AUTOMATIC JOB CONTROL DATA SYSTEM

Carl Pilnick, Consolidated Avionics Corp., Westbury, N.Y.
A.I.E.E. Conference Paper No. 58-591.

A system for the automatic recording of job information is described. An input station taking the place of a time clock in the plant area accepts information from the employee's card punched with his badge number and a "time in" or "time out" code. The second input station accepts information through a keyboard on job number, badge number, craft code, date, shift, and start-stop work code. All data is transmitted to the recording station where it is punched on paper tape for further processing. The entire system is timed by a digital clock set in the recording station. ((This equipment apparently is under development by the author's company.))

A copy of the paper may be ordered from the American Institute of Electrical Engineers, 33 West 39th Street, New York 18, New York. Price is 40¢ each for members, 80¢ for nonmembers.

Comment

EDUCATION FOR EDP *(continued)*

Last month we discussed the need for EDP and systems people who think logically, understand business as a whole and have a good basic education in mathematics. What do these requirements imply for high school and junior college curricula?

Traditionally, high school "business courses" have been designed for students who expect to take office jobs immediately after graduation. Will the traditional "business courses" fit them for EDP? For those who go on to college, is the high school curriculum adequate preparation for advanced study in logic, mathematics, and the ephemeral subject of "understanding business as a whole"? Some early and inconclusive answers to these questions are forming. Here are some examples:

A recent survey[1] of 200 high school business subjects teachers showed they did not expect much change in the present "business course." However, the group as a whole was uniformed on the EDP field, and many appeared to confuse EDP with punch card procedures. Several indicated that they were aware of the changes being wrought by electronic data processing but admitted to knowing less than they should about it. The survey is of value in showing up an area in which education and information about EDP is badly needed.

High School math needs revising

The high school mathematics curriculum is undergoing some long-needed revision by at least two organizations. Valuable experiments are being conducted by the Commission on Mathematics of the College Entrance Examination Board,[2] and by the University of Illinois.[3] The University of Maryland is studying the area of junior high mathematics. Although independent efforts, the programs are similar in approach. The new concept of mathematics takes advantage of the natural curiosity and enthusiasm of children by presenting math "as a body of ideas rather than a collection of skills."[4] The new method imposes upon math teachers a need for their further training in mathematics, and this problem refers back to the teachers colleges which do not present adequate advance study programs for high school math teachers. It is suggested that (as at the University of Illinois) such training should be the combined responsibility of the math and education departments.

Some individuals and organizations are experimenting in pre-college EDP education, both in the high school age bracket and among younger children. Much of the experimentation is in interest-building activity rather than in formal classroom study. Some examples:

- Professor George E. Forsythe, chairman of the Education Committee of the A. C. M., is generating interest among members of the organization in cooperating with local school faculties, sponsoring science clubs, designing and making computer equipment and teaching materials, or promoting the invention of ingenious substitutes where finances prohibit commercially made items.

- Research at MIT, reported by Rollin P. Mayer at the 1956 A. C. M. meeting, indicates the need for inexpensive games and model kits of electronic computing devices for the retail toy trade, as an interest stimulus to children under high school age.

- A programing and coding course was devised by Aaron L. Buchman, a science teacher at a Buffalo high school, with practical experience derived from the students' cooperative building of a small computer from salvaged and surplus components.

- An official of an insurance company with a successful EDP installation is working with local school authorities on plans to introduce concepts of electronic data processing to elementary and 7th and 8th grade pupils on an experimental basis.

The cost of school equipment is one deterrent to an expansion of EDP training, particularly on the high school level. This was mentioned frequently in the survey of business subjects teachers. Part of Professor Forsythe's work is to interest business and industry in underwriting, partially or wholly, the design and manufacture of suitable teaching devices.

A philosophical view of education for the new concepts of business systems might lead to some interesting and valuable studies. Here are two ideas to start on:

1. The business course as we now know it will disappear.

2. Concepts of language and mathematic symbol manipulation will be taught at the primary grade level.

Which ambitious master's degree candidate will volunteer?

References

1. Haga, Enoch J., Research leading to a graduate thesis at Sacramento State College

2. Commission on Mathematics, College Entrance Examination Board, 425 West 117 Street, New York 27, New York

3. University of Illinois Committee on School Mathematics, 1208 West Springfield, Urbana, Illinois

4. Carnegie Corporation Quarterly, 589 Fifth Avenue, New York 17, N.Y.

5. Gibson, E. Dana, "Office Automation: how it will affect business education in the future," THE BALANCE SHEET, November 1957--South-Western Publishing Co., 5101 Madison Road, Cincinnati 27, Ohio

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References

The addresses of publishers and periodicals mentioned in this issue of DATA PROCESSING DIGEST are listed below for your convenience in obtaining further information about the articles or books listed.

The Accountant
4 Drapers' Gardens
Throgmorton Avenue
London EC2, England

Advanced Management
74 Fifth Avenue
New York 11, New York

American Management Association
1515 Broadway, Times Square
New York 36, New York

Automatic Office
5057 Woodward Avenue
Detroit 2, Michigan

Banking
12 East 36th Street
New York 16, New York

Computing News
12805 - 64th Avenue South
Seattle 88, Washington

DataMation
10373 West Pico Boulevard
Los Angeles 64, California

Factory Management and Maintenance
330 West 42nd Street
New York 36, New York

IBM Journal of Research and Development
590 Madison Avenue
New York 22, New York

McGraw-Hill Book Co.
330 West 42nd Street
New York 36, New York

Navy Management Review
Supt. of Documents
U.S. Government Printing Office
Washington 25, D.C.

Operations Research
Mt. Royal and Guilford Avenues
Baltimore 2, Maryland

Product Engineering
330 West 42nd Street
New York 36, New York

Stores
100 West 31st Street
New York 1, New York

Technical News Bulletin
National Bureau of Standards
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U.S. Government Printing Office
Washington 25, D.C.

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Meetings

National Machine Accountants Association 7th Annual Conference
Date: June 18-20, 1958
Place: Atlantic City, New Jersey (Chalfonte Haddon Hall)
Information: Garden State Chapter, N. M. A. A., 259 Clifton Avenue, Neward, New Jersey

National Association of Accountants 39th International Accounting Conference
Date: June 22-25, 1958
Place: Chicago, Illinois (Conrad Hilton Hotel)
Information: National Association of Accountants, 505 Park Avenue, New York 22, New York

5th Annual Symposium on Computers and Data Processing, sponsored by Denver Research Institute
Date: July 24-25, 1958
Place: Denver, Colorado (Albany Hotel)
Information: C. A. Hedberg, Denver Research Institute, University of Denver, Denver 10, Colorado

WESCON
Date: August 19 through 22, 1958
Place: Los Angeles, California (Ambassador Hotel)
Information: WESCON, 1435 South LaCienega Blvd., Los Angeles 35, California

Technical Meeting on Automatic Decision-making, sponsored by Los Angeles Chapter of A. C. M.
Date: August 21, 1958
Place: University of California at Los Angeles

Instrument Society of America Automation Conference
Date: September 15-19, 1958
Place: Philadelphia, Pennsylvania (Convention Hall)

International Systems Meeting, Systems and Precedures Association
Date: October 13-15, 1958
Place: Pittsburgh, Pennsylvania (Hotel Penn-Sheraton)
Information: Mr. A. M. Motter, Jones & Laughlin Steel Corp., #3 Gateway Center, Pittsburgh 30, Pennsylvania

The Institute of Management Sciences Annual Meeting
Date: October 16-18, 1958
Place: Philadelphia, Pennsylvania

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Fifth Annual Computer Applications Symposium, Armour Research Foundation

Date: October 29, 30, 1958
Place: Chicago, Illinois
Information: Armour Research Foundation, 10 West 35th Street, Chicago 16, Illinois

Fourth Electronic Business Systems Conference, sponsored by Western Division of NMAA

Date: October 30, 31, 1958
Place: Seattle, Washington (Olympic Hotel)
Information: E. B. S. Conference, National Machine Accountants Assoc., Western Division, P. O. Box 134, Seattle 11, Washington

National Physical Laboratory Symposium and Electronic Computer Exhibition

Date: November 28-December 4, 1958
Place: London, England
Information: C. V. Wattenbach, Deputy Managing Director, Dictograph Telephones, Ltd., London, England

Eastern Joint Computer Conference

Date: December 1958
Place: Philadelphia, Pennsylvania (Bellevue Stratford Hotel)

International Conference on Information Processing

Date: June 13-21, 1959
Place: Paris or Rome (decision later)
Information: U.S. Committee for the First International Conference on Information Processing, Box 4999, Washington 8, D. C.

SHARED PROGRAMING GROUP

SHARE - Sept. 10-12, 1958, San Francisco

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Training

Operations Research in Production and Inventory Control, sponsored by Case Institute of Technology

Date: June 2-13, 1958
Place: Case Institute, Cleveland, Ohio
Information: R. L. Bell, Engineering Administration Department, Case Institute of Technology, 10900 Euclid Avenue, Cleveland, Ohio

Summer Engineering Seminars, sponsored by The Pennsylvania State University

Introduction to Computer Programming, June 16 to 21
Automatic Data Processing in Business and Industry, June 23 to 28
Scientific and Engineering Computation, July 13 to 25
Mathematical Methods for Management, August 3 to 8
For information, write: Extension Conference Center, The Pennsylvania State University, University Park, Pennsylvania

Computer and Management Science Program, University of Michigan

Summer Session, 1958. Courses on computer engineering, operations research, management sciences, and business data processing are included. Session begins June 16, 1958. For information, write to: Coordinator of Engineering Summer Conferences, 2038 East Engineering Building, Ann Arbor, Michigan.

Industrial Engineering Seminars, Cornell University

June 17-20, 1958. Seven seminar groups: Industrial Management, Manufacturing Engineering, Small Plant Management, Methods and Work Measurement, Data Processing Systems, Applied Industrial and Engineering Statistics, Statistical Aspects of Component Reliability.

Work Simplification and Measurement Conference, sponsored by Wharton School (University of Pennsylvania)

Date: June 16-27, 1958
Place: Philadelphia, Pennsylvania (University of Pennsylvania)
Fee: $375
Information: Dr. Adrian M. McDonough, Director, Wharton Refresher Conference, Wharton School of Finance and Commerce, University of Pennsylvania, Philadelphia 4, Pa.

Advance Business Systems Conference and Workshop, sponsored by Wharton School (University of Pennsylvania)

Date: July 7-18, 1958
Place: Philadelphia, Pennsylvania (University of Pennsylvania)
Fee: $375
Information: Same as above

Electronic Data Processing for Business and Industry (Course 10), sponsored by Canning, Sisson and Associates

Date:	July 28 through August 1, 1958
Place:	New York (Hotel Biltmore)
Fee:	$250
Program:	Emphasis on the applications aspect of electronic data processing, planning for an EDP system
For whom:	Management personnel charged with setting up an EDP system
Information:	Canning, Sisson and Associates, 1140 South Robertson Blvd., Los Angeles 35, California

UNIVAC Training Program for college and university faculty --

Nine classes in various cities in U.S. and Canada provide training for faculty and administrative officials in Univac Systems. Courses begin in June and run to September. For information, write: Remington Rand, Univac Educational Department, 315 Fourth Avenue, New York 10, New York.